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## INTRODUCTION

Mastitis is the most “antibiotic consuming” pathology in dairy medicine. Though antibiotics and antibiograms are known to vets since the early fifties, our practices did not evolved a lot from empiric antibiotic therapy [2]. Nevertheless, there is a surge for rational use of antibiotics. Since 2010 in southern Belgium, an integrated document called “Udder Health File” (UHF, Fig. 1) is sent to farmers participating in the project LAECEA (“milk” in local wallon dialect), which implies the recording of clinical mastitis cases.

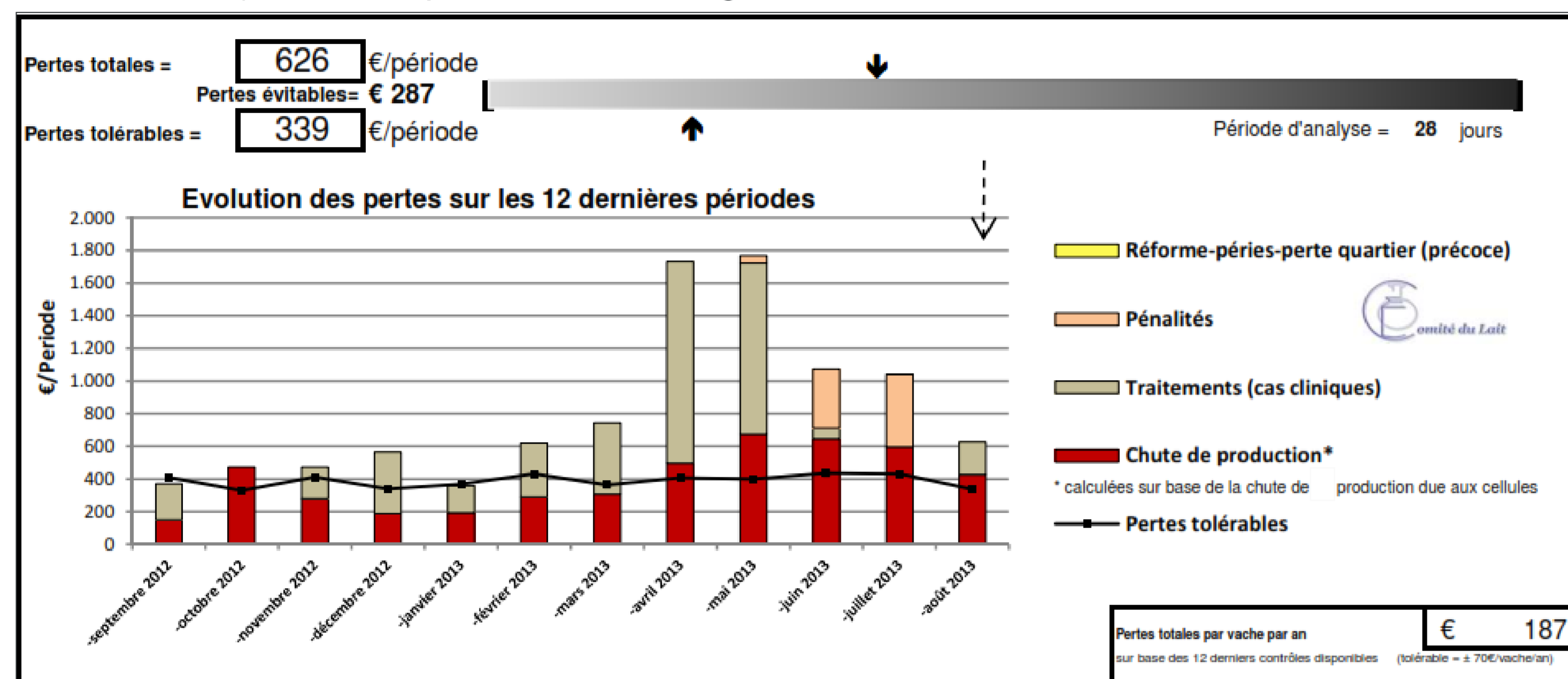


Figure 1: Economic control panel of the Udder Health File summing-up all losses linked to mastitis. In yellow the loss due to Culling, death or quarter losses; in orange the penalties for bad milk quality; in grey the mastitis treatments and in red the subclinical losses due to cell counts. The black line reminds the “tolerable losses” according to a fair rate of mastitis, either clinical or subclinical. At the bottom right, the total loss per cow per year of this farm is 187 euros, where the tolerable level is around 70€/cow/year.

So far 1194 mastitis treatment events were recorded in the 30 farms participating the research project [3]. In order to evaluate mastitis treatment strategies, we chose to compare tissular cure (TC) based on the threshold of 200.000 somatic cells/ml in milk at milk control at least 60 days after the clinical mastitis event. It was considered a new case a cow which at least 15 days before had an SCC <200.000 cells/ml, other were marked as chronic cases.

## RESULTS & DISCUSSION

### A. Characteristics of clinical mastitis in the cohort

Our mastitis cohort (1194 cases) revealed different known characteristics in western countries like a peak of incidence from January to May, and posterior quarters tended to be more affected by clinical cases. Treatment constituted most of the time in Intramammary tubes associated or not with a parenteral antibiotic, anti-inflammatory drug were used in 10% of cases (Fig. 3). We also noted that most clinical cases are either grade 1 or 2 mastitis, severe cases representing 10% of all recordings, subclinical mastitis treatment is not very spread in Belgium, and represented less than 1% of cases in the cohort (Fig. 4).

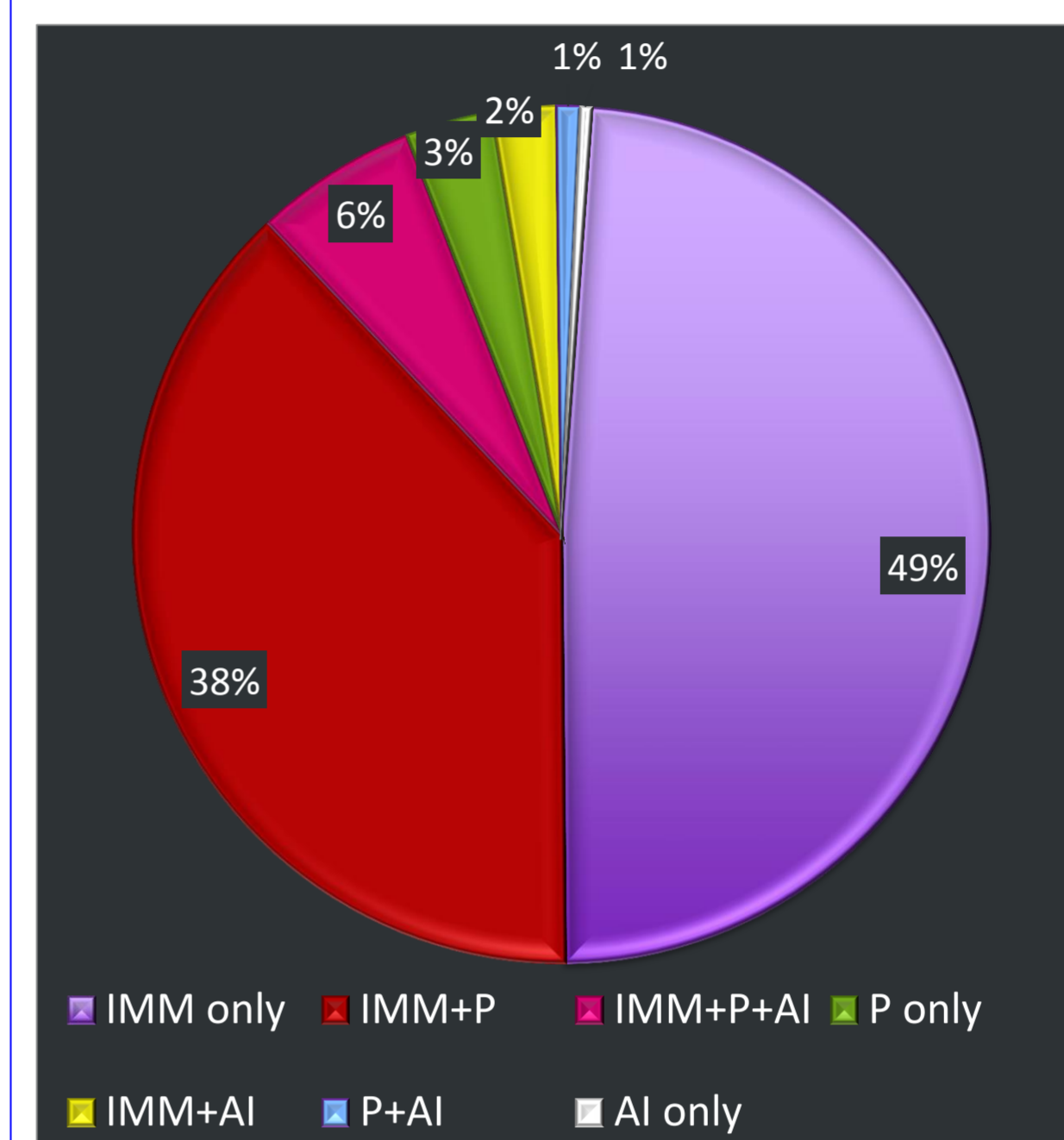


Figure 3: Distribution of treatments combinations (IMM: intramammary route ; P : parenteral route AB; AI : Use of Anti-inflammatory drug in parenteral administration)

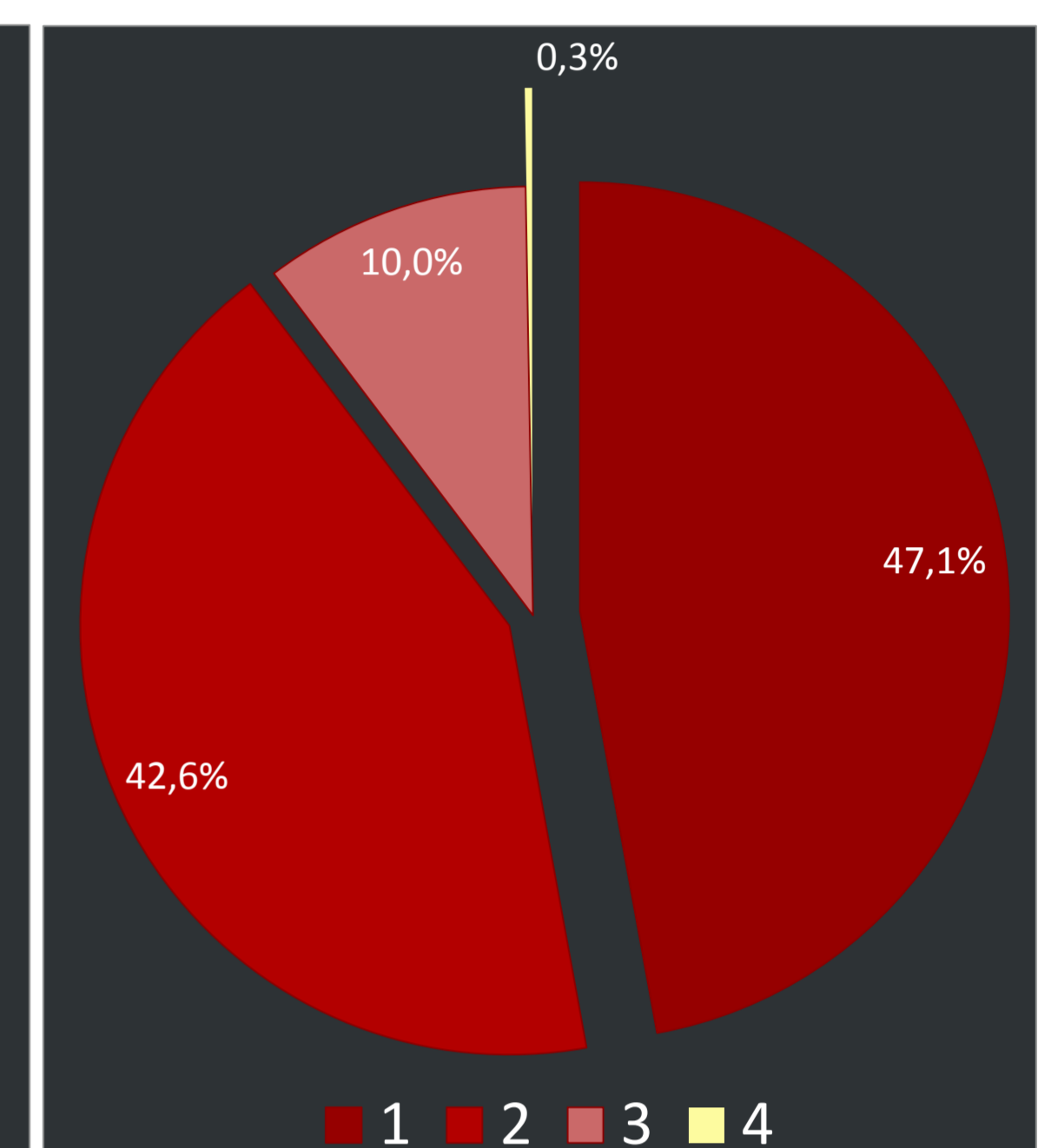


Figure 4: Distribution of mastitis severity in the database (1 : alteration of milk; 2 udder swollen/painful; 3 general signs like anorexia, hyperthermia or recumbency; 4 : treatment of a subclinical case).

### B. Analyzing Cure rates according to time/seasonality, cellular history and animal characteristics

Our cohort have a calving peak between November and February, so most cases of first trimester occurred between January and April, the peak of incidence remains the second month in milk (Fig. 5).

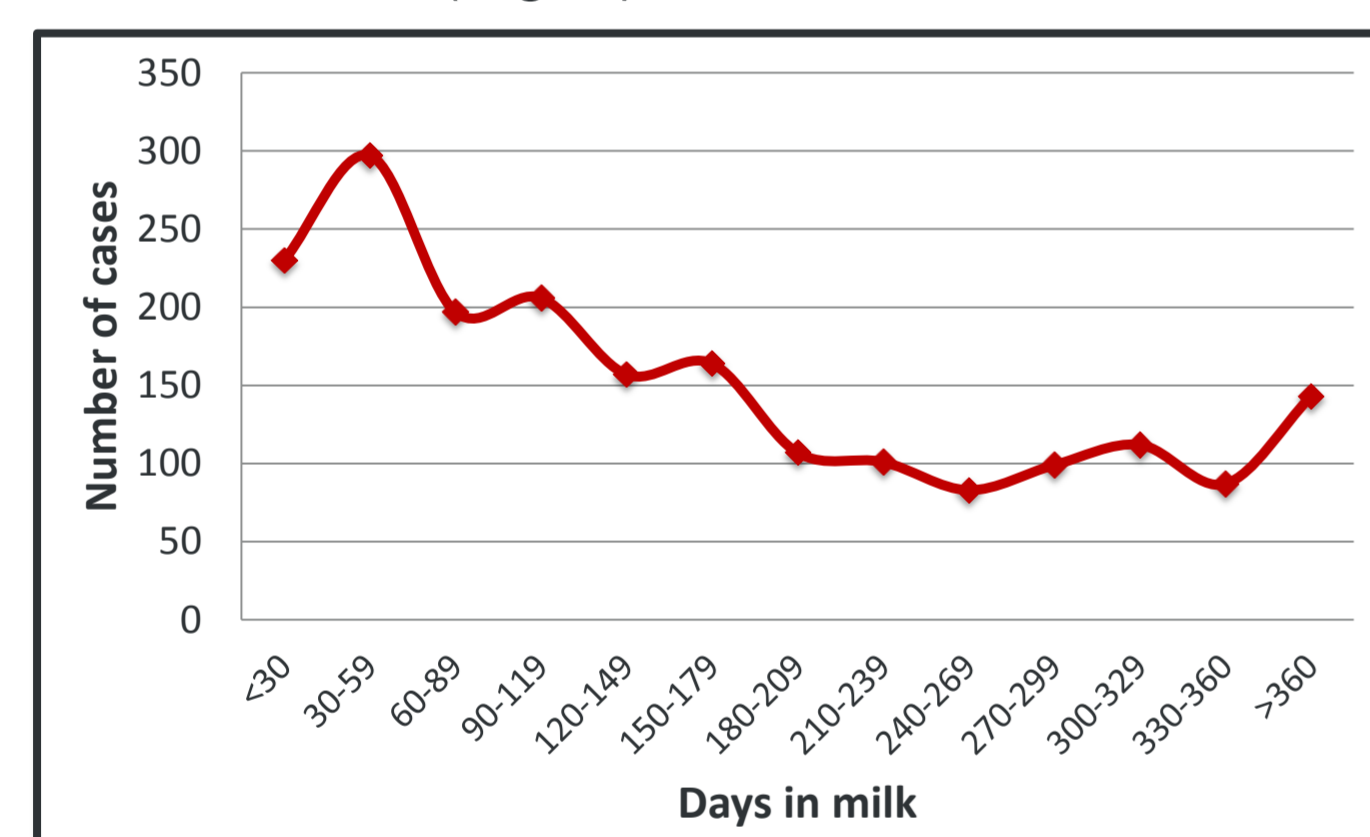


Figure 5: Incidence of treatments along lactation in days in milk.

Rear quarters had significantly lower TC ( $p<0,05$ ). Grade 3 mastitis had lower TC, 42,6% ( $p<0,05$ ) versus 48,9 % for grade 2 and 44,2% for grade 1. Almost 47% of all mastitis was considered as chronic cases. Indeed, TC was lower on cases from more than 4 month in milk, third lactation (OR = 2.8 for no cure) compared with previous, and chronic cases (OR=2,6). Seemingly, chronicity was positively associated with parity and season. The 3rd parity cases had higher chances to be chronic ones (OR = 1,7), as well as cases from April to September (OR = 1,6).



Figure 6: Variation of TC at 60 days depending on various factors relative to the clinical case, the cow or the time. The overall cure rate is in plain green. Each variable has a maximum cure rate in hatched green. In our cohort, primiparous cows achieved better cure rates for example. In red we displayed significant odds-ratio for no cure risk.

## CONCLUSION

Cross-sectional analysis of health data is always challenging, because of the variety of data, the bias and the data loss. However, these data have shown that use of antibiotics in mastitis is around 80%, with less than 60% chance of reaching good somatic cell counts afterwards. With a simple look at DHI data, a mastitis could be better managed in an in-farm protocol [4].

It is interesting that most efficient molecules are wide spectrum association or steroidal anti-inflammatory combination; along with the increased cure rates observed when using parenteral AI. These results underlines the question of the management of inflammation in mastitis, which is not well accounted for [2], as well as Gram negative infection risk in lactation rather than just post-partum.

Future recommendations over the limitations of AB use should therefore include epidemiological alerts for the risk of chronic cases, least susceptible to be correctly treated, and also alternatives in the treatment protocol, such as focusing on inflammation rather than only infection of the quarters.

## ACKNOWLEDGEMENTS

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[www.udderhealth.be](http://www.udderhealth.be) / [www.mammite.be](http://www.mammite.be)

### C. Analyzing cure rates according to treatment type and molecule

While refining data with treatment protocol, it could be frustrating because or the different routes and molecules used, that weakens the comparison. Nevertheless, it was underlined that 4th generation cephalosporins (C4G) were the most used in our cohort, followed by aminopenicillin/methicillin association (PENA/PENM) and 1st generation cephalosporins/aminoglycosids (C1G/AG) association. Of these intramammary treatments, 20% of the cases were submitted to a second intramammary drug, mostly C1G or C1G/AG. Parenterally treated cases were administered mostly macrolids, fluoroquinolones and penethacillin. Finally, most used anti-inflammatory drugs were tolfenamic acid and flunixin-meglumin.

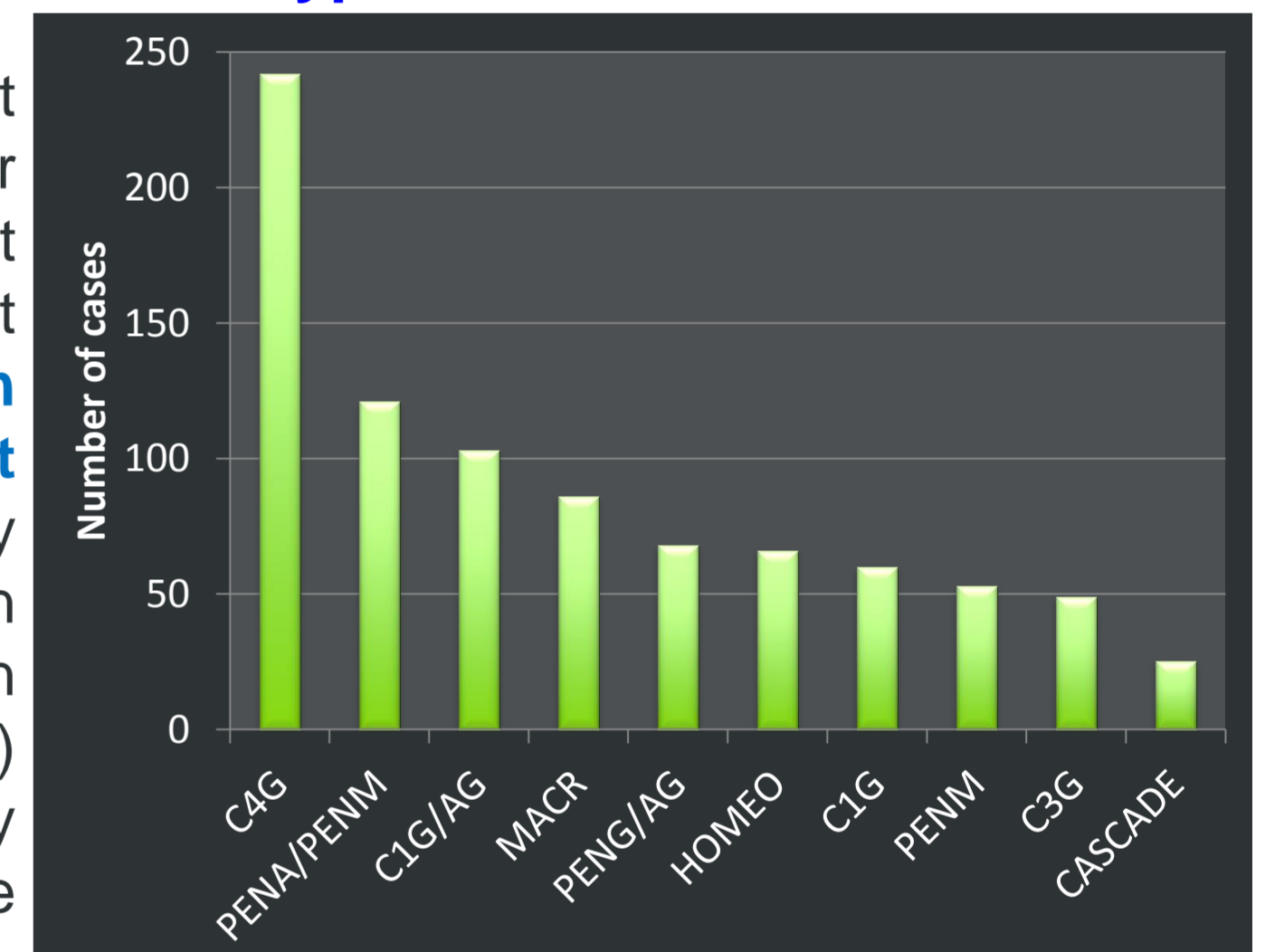


Figure 7: Use of intramammary antibiotics according to molecules and associations (C4G= 4th generation cephalosporin, PENA/PENM = aminopenicilline/methicilline, C1G/AG = 1st generation cephalosporine/Aminoglycoside ; MACR = Macrolids ; HOMEQ = non veterinary labelled drugs phyto/homeo ; C1G = 1st generation cephalosporine, PENM = Methicilline, C3G = 3rd gen. cephalosporin, CASCADE = Imported veterinary drugs).

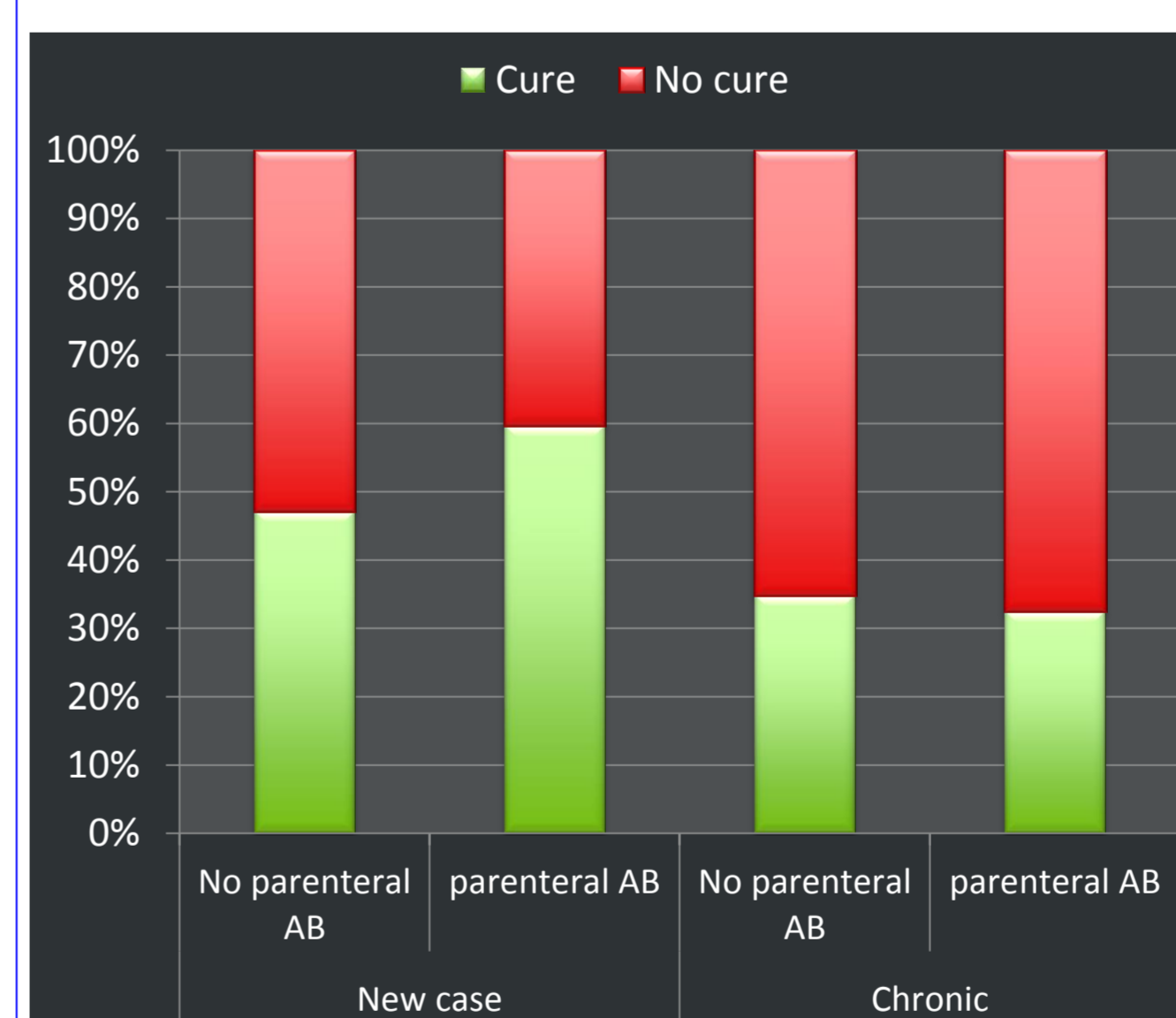


Figure 8: Impact of a parenteral antibiotic according to chronicity of the case

Use of a parenteral injections increased TC only on new cases (+12%), but not on chronic cases. Refining by severity, TC improved with a parenteral on new cases, mainly in grade 1 (+20%).

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It is interesting to note that combination of AI and parenteral AB are associated with increased cure rates.

Combination	Odds-ratio for no cure	p-value
IMM+AI	0,74	p<0,05
IMM+P	0,75	p<0,05
IMM+P+AI	0,49	p<0,05
IMM+P+AI on new cases	0,61	p<0,05
IMM+P+AI on chronic	0,42	p<0,05

Table I: Association of combination of AI and Parenteral AB effect on cure rates.

Best cure rates according to IMM use, with no parenteral AB nor AI were achieved by C1G/AG, PENA/PENM associations, and Prednisolone containing products (CASCADE), reaching more than 50% of cure.